DUSKY DOLPHIN RESEARCH AT KAIKOURA, NEW ZEALAND:

A PROGRESS REPORT

FRANK CIPRIANO*

Department of Ecology and Evolutionary Biology
University of Arizona
Tucson, Arizona, 85721 U.S.A.

ABSTRACT

Researchers from New Zealand and the United States are currently studying dusky dolphins (*Lagenorhynchus obscurus*) in the Kaikoura region of the South Island of New Zealand. Observations from shore and small boats are used to record seasonal and daily changes in behaviour and habitat utilization. Beach-cast and incidentally captured dolphin specimens are dissected for analysis of stomach contents, parasite loads, reproductive condition and growth/age relationships. Progress since January 1984 includes the collection of seventeen dolphin specimens, documentation of seasonal and daily movement patterns, the first collections of parasites from dusky dolphins, the use of radio-tracking to observe diurnal activity patterns, and ageing of fresh and museum specimens using tooth growth layers.

INTRODUCTION

The dusky dolphin (*Lagenorhynchus obscurus*) is one of the most commonly occurring cetaceans in the nearshore area around the South Island of New Zealand. It is found only in temperate waters of the southern hemisphere (Brownell, 1974), although other congeners are found in northern hemisphere seas and in higher or lower latitudes (Gaskin, 1976). The only thorough set of investigations on this species was by Würsig and Würsig (1979,

* Contact address: Edward Percival Field Station,
Esplanade, Kaikoura,
New Zealand.

1980)', who reported on their behaviour and ecology in the coastal waters of Argentina. Although common, little is known of their ecology and behaviour in New Zealand waters. It is known that they occur in the nearshore area in large numbers throughout the year, but with as yet incompletely understood changes in seasonal and diurnal distribution (Gaskin, 1968a, 1968b; Baker, 1972, 1983). Growth, diet, life history, and parasites have not yet been described. The relatedness of New Zealand dusky dolphins to other populations is also unknown.

Since January 1984 a group of researchers from New Zealand and the United States has been studying dusky dolphins in the Kaikoura region of the South Island of New Zealand. This area is well suited for such work, since there is a coastal road and many excellent observation stations on hills along a coastline with an abundance of dolphins. Movements and activity patterns can be studied from shore by well-established tracking and behaviour monitoring techniques (e.g. Saayman and Tayler, 1979; Norris and Dohl, 1980). Additionally, some individuals are killed incidental to fishing operations or are found dead on beaches, and these specimens can provide much information. Although the behaviour of several dolphin species including dusky dolphins (Würsig and Würsig, 1980), bottlenose dolphins (e.g. Shane, 1980; Wells et al., 1980), spinner dolphins (Norris and Dohl, 1980) and humpback dolphins (Saayman and Tayler, 1979) has been studied using similar methods, precise information on prey types and seasonal variation in prey availability have usually not been available.

Our study emphasizes three separate but interrelated areas of interest: LIFE HISTORY STUDIES (Alan Baker and Marc Webber); PARASITE BIOLOGY (David Blair and Jan McKenzie); and BEHAVIOUR AND FEEDING ECOLOGY (Bernd Würsig and Frank Cipriano). Contact addresses of participants are listed in Appendix 1.

METHODS

Permits for the collection of dolphin specimens and allowing captures, tagging, and close observations of dusky dolphins have been obtained from the Fisheries Management Division, Ministry of Agriculture and Fisheries, Wellington, New Zealand.

A standardized dissection protocol and methods for surveying, collecting and preserving parasites was developed during the analysis of our first few dolphin specimens (Cipriano et al., this volume). Samples collected from each specimen included: skulls, stomach contents, teeth, gonads, mammary tissue (from females only), and parasites; organ weights were also recorded. Tissue samples or entire organs were sometimes collected for parasite analysis.

Fish otoliths and squid beaks are used to identify prey species from stomach contents of dolphin specimens. Interpretation of feeding habits follow suggestions given in Fitch and Brownell (1968). The use of parasites as indicators of distribution and diet follows Dailey and Otto (1982). Tooth sectioning, staining, and ageing methodology being used generally follow procedures described by Myrick et al. (1983).

To allow comparison of results between Argentine and New Zealand dusky dolphins the observational methods being used in our study mainly parallel those used by Würsig and Würsig (1980). Photo-identification of dolphins (Würsig and Würsig, 1977) during small-boat surveys is also used for analysis of individual behaviours and social affinities. Radio-tracking of tagged individuals is used to study diurnal activity patterns and movements (Würsig, 1982).

LIFE HISTORY STUDIES

Little is known of the life history of most free-living cetaceans. A basic understanding of age/growth relationships, life span, age at first reproduction, and reproductive capacity is necessary for any assessment of population growth and stability. Additionally, information of this sort is needed for understanding and interpreting other aspects of our study.

Seventeen dusky dolphin specimens were collected between January, 1984 and August, 1985. These included four females (one adult, one foetus one sub-adult and one juvenile), twelve males (six adults, two sub-adults, four juveniles) and one adult of undetermined sex. Complete skeletons were collected from seven of the specimens.

Methods for decalcifying, sectioning and staining dusky dolphin teeth were developed by Marc Webber at the National Marine Fisheries Service tooth-ageing laboratory in La Jolla, California, under the direction of Dr Al Myrick. Teeth from nine of our specimens and from 24 dusky dolphins from museum collections have been aged thus far.

Preliminary analysis of specimens has revealed that dusky dolphins can reach over thirty years in age. Reproductive activity appears to reach a peak during the summer months. Testis weights were greatly increased in adult male specimens collected in summer and very small juveniles were observed only during summer months, but copulations were observed during all months when surveys took place.

PARASITE BIOLOGY

Although they play an important role in the population biology of many wild animals, parasite infestation levels and their effects on free-living dolphins are virtually unknown. In our study of dusky dolphins we are attempting to document the extent, as well as the identity, of parasite infestation over different years and seasons. This will provide the first description of the parasites of dusky dolphins, and may also reveal correlations of parasite types or infestation levels with distribution patterns, seasonality in dolphin movements, age, sex, or reproductive state.

To date, parasites have been collected from sixteen dusky dolphin specimens (excluding the foetus). Endoparasites (including nematodes, trematodes, and cestodes) were found in nasal passages, middle ear cavities, lung tissue, blubber and fascial muscle, stomachs, intestines, liver tissue, and heart tissue. Ecto-parasitic cyamid amphipods were found on two specimens. Preliminary analysis of the evidence thus far collected suggests a linear increase with age in the numbers of some types of parasites, and trans-placental or trans-mammary transmission of others, but a larger sample size is needed for confirmation of these trends.

BEHAVIOUR AND FEEDING ECOLOGY

The focus of our behavioural research effort is an investigation of the types of prey eaten by dusky dolphins, routes and areas used most often, and seasonal changes in dolphin distribution and behaviours. This information will help build an understanding of the dolphins' place in the food chains of the coastal region and their use of commercially important fish stocks.

Coastal sighting surveys and shore-based observations have been carried out over eleven months since January, 1984 (Jan. to Aug. 1984, Jan. 1985, mid-June to mid-Aug. 1985), comprising two summer seasons, one autumn, and two winters. Theodolite-tracking of nearshore groups was performed from two hilltop observation stations over the summer and autumn months. Boat surveys were made on 43 occasions, a total of 140 hours of boat time was logged, and over 4,500 film exposures were taken for photo-identification of naturally marked individuals. Dusky dolphins were mainly found in groups of 100-400 individuals but larger groups (over 1000) and solitary dolphins and smaller groups (two to twenty animals) were sometimes encountered. Preliminary analysis of sighting data suggests that dolphin groups moved over greater areas in winter, sometimes passing completely through the survey area in a few hours, and were generally found farther offshore than in summer or

autumn. From repeated surveys in summer months it appears that some dolphin groups remained within the study area for weeks or months at a time, and individually recognizable dolphins were encountered repeatedly between February, 1984 and January, 1985.

Four dolphins were captured and three radio-tagged in July, 1984. Dive intervals of radio-tagged dolphins were recorded for thirty minutes every three hours while dolphins remained within the reception range of shore-based receivers, over two weeks of radio-observations. Dive times of dolphins radio-tagged in winter seldom exceeded two or three minutes. Movements of the three tagged individuals ranged from only a few to over thirty kilometers in a day.

Stomach contents of dolphin specimens collected were examined; otoliths, recognizable fish skulls and squid beaks were separated out, and these sorted and counted. Otolith and squid beak types have been identified and known types used to start a reference collection for use in identifying stomach contents from specimens collected in the future. Although commercially important fish species (hoki, *Macruronus novaezealandiae*, red cod, *Pseudophycis bachus* and flounders, Pleuronectidae) were found, preliminary analysis of stomach contents suggests that small lantern fish (Myctophidae) may be a more important food resource than larger, commercially important species.

Seven aerial survey flights were made between March and August, 1984 along the east coast of New Zealand from Pegasus Bay to Wellington. Positions and size of dolphin groups encountered during aerial surveys were noted and reference photographs of group size and appearance were taken. Dolphin groups were mainly encountered in the area between Haumuri Bluffs and the Kaikoura Peninsula, off the Clarence River mouth, and in Cook Strait south of Island Bay, Wellington.

ACKNOWLEDGEMENTS

The work carried out thus far would not have been possible without the help of the faculty, students and staff of the Zoology Department, University of Canterbury. Bill Davison, Neil and Susan Cairns, Lynda Delph-Lively, Craig Franklin, Ian Flux, Tracey Osborne, Chris Lalas, Mark Lawrence, Curt Lively, Barbara McKnight, John Morris, Izzy and Ginny Sczepaniak, Greg Sherley, Ramari Stewart, Roger Sutherland, Barbara Todd, Jack van Berkel and Melanie Würsig helped with boat surveys. Captain Richard Lamb of Safe Air Ltd. arranged for aerial survey flights aboard their Bristol Freighters and flight crews allowed the use of their cockpits and contributed sighting information. The fishermen of Kaikoura, many Kaikoura residents, Mr Geoff Harmon and his

employees at Virgo Fisheries, Ltd. helped with the collection and storage of dolphin specimens. Wairau Fisheries, Kaikoura, allowed the use of their scales for weighing dolphin specimens. Chris Lalas arranged for the shipment of two frozen dolphins from Dunedin to Kaikoura.

Identification of stomach contents has been carried out with the assistance of Mike Imber (New Zealand Wildlife Service) and Chris Paulin (National Museum of New Zealand). Martin Cawthorn (Fisheries Research Division, Ministry of Agriculture and Fisheries) reviewed permit applications and contributed valuable suggestions and information.

This research has been supported in part by contributions from Alpha Delta Kappa Educational Scholarships, Kansas City, the California Marine Mammal Center, the Committee on Grants-in-Aid of Research of Sigma Xi Foundation, the Graduate College of the University of Arizona, and the United States-New Zealand Cooperative Research Program of the United States National Science Foundation.

LITERATURE CITED

BAKER, A.N. 1972. New Zealand Whales and Dolphins. *Tuatara 20:* 1-49.

BAKER, A.N. 1983. *Whales and Dolphins of New Zealand and Australia.* Victoria University Press, Wellington. 133 pp.

BROWNELL, R.L. 1974. Small odontocetes of the Antarctic. *IN:* Brown, S.G. et al. (eds.) *Antarctic Mammals.* Antarctic Map Folio Series, No. 18. pp. 13-18.

DAILEY, M.D. AND OTTO, K.A. 1982. *Parasites as biological indicators of the distributions and diets of marine mammals common to the eastern Pacific.* National Marine Fisheries Service, Report LJ-82-13C. 44 pp.

FITCH, J.E. AND BROWNELL, R.L. 1968. Fish otoliths in cetacean stomachs and their importance in interpreting feeding habits. *Journal of the Fisheries Research Board, Canada 25:* 1561-2574.

GASKIN, D.E. 1968a. *The New Zealand Cetacea.* Fisheries Research Division, Bulletin Number 1, New Zealand Marine Department, Wellington. 92 pp.

GASKIN, D.E. 1968b. Distribution of Delphinidae (Cetacea) in relation to sea surface temperatures off eastern and southern New Zealand. *New Zealand Journal of Marine and Freshwater Research 2:* 527-534.

GASKIN, D.E. 1976. The evolution, zoogeography and ecology of Cetacea. *Oceanography and Marine Biology Annual Review 14:* 247-346.

MYRICK, A.C.JR., HOHN, A.A., SLOAN, P.A., KIMURA, M. AND STANLEY, A. 1983. *Estimating Age of Spotted and Spinner Dolphins (Stenella attenuata and Stenella longirostris) from teeth.* NOAA Technical Memo NOAA-TM-NMFS-SWFC-30. 17 pp.

NORRIS, K.S. AND DOHL, T.P. 1980. Behavior of the Hawaiian spinner dolphin *Stenella longirostris. Fisheries Bulletin 77:* 821-849.

SAAYMAN, G.S. AND TAYLER, C.K. 1979. The socioecology of humpback dolphins (*Sousa* sp.). *IN:* Winn H.E. and Olla B.L. (eds.) *The Behavior of Marine Animals, Volume 11.* Plenum Press, New York. 438 pp.

SHANE, S.H. 1980. Occurrence, movements, and distribution of bottlenose dolphin, *Tursiops truncatus,* in southern Texas. *Fisheries Bulletin 78:* 593-601.

WELLS, R.S., IRVINE, A.B. AND SCOTT, M.D. 1980. The social ecology of inshore odontocetes. *IN:* Herman, L. (ed.) *Cetacean Behaviour.* 463 pp.

WÜRSIG, B. 1982. Radio-tracking dusky porpoises in the South Atlantic. *IN: Mammals in the Seas, Volume IV.* FAO Fisheries Series Number 5, Food and Agriculture Organization, United Nations, Rome.

WÜRSIG, B. and WÜRSIG, M. 1977. The photographic determination of group size, composition, and stability of coastal porpoises (*Tursiops truncatus*). *Science 198:* 755-756.

WÜRSIG, B. AND WÜRSIG, M. 1979. Day and night of the dolphin. *Natural History 88:* 60-67.

WÜRSIG, B. AND WÜRSIG, M. 1980. Behavior and ecology of the dusky dolphin, *Lagenorhynchus obscurus,* in the South Atlantic. *Fisheries Bulletin 77:* 871-890.

APPENDIX 1

Addresses of Other Participants in the Research Programme

Dr Alan Baker
National Museum of New Zealand
Private Bag
Wellington, NEW ZEALAND

Dr David Blair
Miss Jan McKenzie
Zoology Department
University of Canterbury
Christchurch 1
NEW ZEALAND

Mr Marc Webber
460 Lansdale Avenue
San Francisco, California
94127 U.S.A.

Dr Bernd Würsig
Moss Landing Marine
Laboratories
P.O. Box 450
Moss Landing, California
95039-0223 U.S.A.